EDUCATION PROFESSIONAL STANDARDS BOARD
STAFF NOTE

Information/Discussion Item A

Information Item:

Mathematics Task Force recommendation for elementary education teachers

Applicable Statutes and Regulation:

KRS 161.028, 161.048
16 KAR 5:010

Applicable Goal:

Goal 1: Every approved educator preparation program meets or exceeds all accreditation standards and prepares knowledgeable, capable teachers and administrators who demonstrate effectiveness in helping all students reach educational achievement.

Background:

During the 2005 regular session of the General Assembly, House Bill 93 was enacted, establishing by statute the Committee for Mathematics Achievement (CMA) that would be housed at the Kentucky Department of Education (KDE). The legislation requires the committee to "develop and oversee a multi-faceted strategic plan to improve student achievement in mathematics at all levels of schooling in Kentucky." By December 2006 the CMA had developed a strategic plan for presentation to the Education Assessment and Accountability Review Subcommittee of the Kentucky General Assembly (EAARS).

During the August 2006 retreat of the Council on Postsecondary Education (CPE), the Research, Economic Development and Commercialization Policy Group created the CPE STEM (Science, Technology, Engineering, and Mathematics) Task Force, a group of 110 highly skilled professionals in their respective disciplines. The task force was charged to "develop a statewide strategic action plan to accelerate Kentucky's performance with the STEM disciplines." The action plan of the STEM Task Force was presented to CPE March 2007 for implementation.

The Education Professional Standards Board (EPSB) reviewed and discussed both the CMA and STEM strategic plans during the June 2007 annual retreat. Particular attention was given to the sections in both reports that focused on the EPSB and the role of colleges and universities in preparing teachers in the STEM disciplines. The EPSB decided to focus on elementary mathematics teachers and requested that staff submit names for appointment to a task force. Members of the Mathematics Task Force (MTF) were appointed during regularly scheduled board meetings in October and November of 2007.

Members of the MTF first met on February 11, 2008, and immediately addressed the issues related to the preparation of elementary teachers to teach mathematics. Dr. Phillip

Rogers, EPSB Executive Director, gave the charge to the group stating that "nothing is off the table here. We need a continuum that clearly prepares teachers." The overarching question: What do elementary teachers need to know and be able to teach in math? As the MTF members began to identify the issues, the discussion included the need for elementary teachers to have a depth of mathematical knowledge beyond the content they teach as well as the ability to think mathematically. Task force members also agreed that teachers need a bigger toolbox of strategies to reach students with different learning styles. Finally, the MTF recommended the establishment of a mathematics endorsement. (Task Force recommendations are attached.)

Groups Consulted:

Mathematics Task Force

Contact Person:

Dr. Marilyn K. Troupe, Director
Division of Educator Preparation
(502) 564-4606
E-mail: marilyn.troupe@ky.gov

_____

Executive Director

Date:

September 22, 2008

EDUCATION PROFESSIONAL STANDARDS BOARD

MATHEMATICS TASK FORCE

Recommendation I:
Develop an Endorsement Certificate for Mathematics

Rationale:
The education of elementary math teachers should continue beyond initial certification. The mathematics endorsement should provide teachers with mathematical content and pedagogical knowledge and skills to enhance their preparation as classroom teachers to enrich the curriculum in the schools. These teachers may be teacher leaders to whom other teachers can turn for support in the teaching of math.

Recommendation II:
Educator preparation programs should adopt a three-pronged approach to preparing elementary teachers to teach math.

A. Mathematical Knowledge for Teaching (MKT)

Educator preparation programs should reorganize mathematics courses to accomplish the following:

- Embrace current approaches for math educator programs because pre-service preparation is crucial
- Emphasize deepening teachers' knowledge of the mathematics they teach as well as increasing their understanding of why math procedures work
- Emphasize promoting mathematical reasoning, sense making, problem solving, computational fluency, and justification, each facilitating the learning of the others
- Ensure that the Kentucky Program of Studies and the Core Content for Assessment are covered by courses and are viewed collaboratively with districts, teachers, and arts and sciences faculty

B. Pedagogical Content Knowledge (PCK)

Educator preparation's mathematics programs should ensure that candidates learn the following:

- How children learn mathematics so teachers can use different texts and design instruction to meet individual learning needs
- How to determine what students know and understand, using formative assessments to guide instruction
- How to provide strategies and resources for teaching mathematics, including those for differentiated instruction

C. Verticality (V) of the Mathematics in P-12 Curriculum

"Teacher education programs and licensure tests for early childhood teachers, including all special education teachers at this level, should fully address the topics on whole numbers, fractions, and the appropriate geometry and measurement topics in

the Critical Foundations of Algebra, as well as the concepts and skills leading to them; for elementary teachers, including elementary level special education teachers, all topics in the Critical Foundations of Algebra and those topics typically covered in an introductory Algebra course; and for middle school teachers, including middle school special education teachers, the Critical Foundations of Algebra and all of the Major Topics of School Algebra." *The National Mathematics Advisory Panel Final Report - 2008*

- Teachers should have a sense of how concepts are introduced in the elementary curriculum and then woven through the middle school curriculum.
- Teachers need to see the vertical nature of mathematics, to understand that teaching fractions in elementary lays the foundation for algebra in middle school.
- Colleges/universities should determine the desired math learning outcomes and design courses to meet those outcomes.
- IHE's should ensure that their preservice teachers are well-versed in the Kentucky Program of Studies and the Core Content for Assessment.

Recommendation III:

- Colleges/universities should identify where in their mathematics courses/program the three components (MKT, PCK and V) are emphasized.

Recommendation IV:

- As curriculum changes, educator preparation programs and school districts should collaborate in co-designing mathematics courses.

Recommendation V:

- Provide opportunities for PreK-12 teachers to collaborate and discuss the challenges and issues of teaching math across grade levels.
- Communicate the outcome of such discussions to administrators.

Rationale for recommendations II through V:
"The national advisory panel has recommended that the PreK-8 content curriculum should be streamlined to emphasize the topics in what the panel calls the Critical Foundations of Algebra. These topics are very closely aligned to the topics recommended by the National Council of Teachers of Mathematics (NCTM) in its 2006 publication, *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*." *The National Mathematics Advisory Panel Final Report - 2008*

The MTF supports the National Advisory Panel's recommendation that the PreK-8 mathematics curriculum be streamlined through collaborative efforts of the Kentucky Department of Education and the Education Professional Standards Board.

BIBILOGRAPHY

Cavanagh, Sean, *Essential Qualities of Math Teaching Remain Unknown*, Education Week, March 28, 2008

Friedberg, Solomon, *Teachers must be up for count*, Boston Herald, April 23, 2007

Hechinger, John, *Effort to Fix 'Broken' System Sets Targets for Each Grade*, Avoids Taking Sides on Method, March 5, 2008

Kessel, Cathy and Ma, Liping; *What we think that elementary teachers need*, National Council of Teachers of Mathematics, 2008

Manzo, Kathleen Kennedy, *U.S. Middle-Grades Teachers Found III-Prepared in Math*, Education Week, December 19, 2007, Vol. 27.No. 16

Millman, Richard and Ma, Xin; *The Design of a Mathematics Content Course to Integrate the Assessment Principle: Recent Results*, October 17, 2005

Newman, Steve, *The Algebra Problem*, White Paper, Department of Mathematics, Northern Kentucky University

Reys, Barbara, *Who should lead mathematics instruction at the elementary school level: a case for mathematics specialists*, National Council of Teachers of Mathematics, Inc., 2003

Schencker, Lisa, Math report recommends teachers focus more in depth on fewer skills, Salt Lake Tribune, April 11, 2008

Zuckerbrod, Nancy, *Poor math scores are examined: More focus urged on basics, fractions, Herald-Leader*, March 14, 2008

Dr. Deborah L. Ball, Dean of the School of Education and William H. Payne Collegiate Professor at the University of Michigan. Dr. Ball, a former elementary school teacher, was a member of the National Mathematics Advisory Panel appointed by the President.

Dr. Lee Shulman was President of the Carnegie Foundation for the Advancement of Teaching. His focus has been on strengthening the role of teaching in higher education. Through the Carnegie Foundation he has "emphasized the importance of 'teaching as community property' and the central role of the scholarship of teaching in supporting the needed changes in the cultures of higher education." Teaching and teacher education have been the focus of his writing.

Committee on Mathematics Achievement, Strategic Plan for Improving Mathematics Achievement in Kentucky, January 2007

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics, National Council of Teachers of Mathematics, 2006

The National Mathematics Advisory Panel Final Report: Foundations for Success, The National Mathematics Advisory Panel, U.S. Department of Education, 2008